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ABSTRACT

Assuming that although the pre-operational child generates syntactic utterances, it cannot be inferred that he can comprehend the process of analyzing or synthesizing words or utterances as specimens, it would follow that trying to teach pre-operational children to read by decomposing words or sentences, on the assumption that words and the relations between words can then be synthesized, may be analogous to trying to train Piagetian operations. To determine what reasoning tasks we ask the child to perform when we ask him to analyze printed words so that he can pronounce them, the instructional steps in several primers and first readers of several basal reader series were examined. This was approached in two ways: (1) to translate the logical steps that are required of the child by each lesson into descriptive, abstract notations; and (2) to develop an analogue of the set of grapheme-phoneme correspondences for many of the phonics lessons in the teachers' manuals. Results from using the analogues indicated that children have much more difficulty with rules that involve changes from a regular pattern, children were often able to do the analogue lessons more easily than the parallel phonics lessons, and the same basic concepts are taught using different places within the same manual. (HOD)

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Children's Metalinguistic Concepts and Reading

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What do young children understand about the nature of language? Do their concepts of language tell us anything about the problems of learning to read?

Any natural language is a very complex abstract system, and it would not be surprising if young children only dimly grasped its nature, even though they learn remarkably early to follow many of its complex rules. In several ways, the child's limited conceptualizations of language appear to present hazards to his learning to read, and many steps in reading instruction that seem logical to us as adults may make little sense to six-year-olds. They learn the patterns and function according to the rules but in spite of, not because of, the logical analysis with which we try to guide them.

Let us consider some of the things that have been learned about children's understanding of language, starting with their global conceptions of language as a communication system and progressing to the notion of written representations or classes of speech sounds.

Several students of children's language development have observed that young children see the name of an object as an attribute of the object and regard the name as being as real as the object it denotes. "...one finds, at early stages of representation, that a name is treated

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as if it were of the same nature...as a thing, and action with or upon a name is akin to action with or upon a thing (Werner & Kaplan, 1963, p. 47)." Piaget (1929) called this conception of words nominal realism.

A study of Brook (1967) is representative of much work on children's conceptions of language. Brook replicated and extended Piaget's (1926, 1929) early studies of children's understanding of the nature of language.

Piaget describes three major steps in the child's development away from nominal realism. These stages can be illustrated by sample answers given by some of the children Brook interviewed. In stage I, Children view the word as an attribute of the object. ("How did the name of the sun begin?" "The name of the sun comes from the sun." or "People looked at the sun and saw its name, sunny.") In stage II, children see words as being in harmony with the things they name. ("Why is the sun called the sun? "Because the name sounds like it is very hot and burning.") In stage III, children recognize the arbitrary nature of words. ("People made up a language, told others and passed it down.")

Most children, when they come to first grade and begin to learn to read, are in the earliest of these stages--stage I. In addition to their lack of understanding of the arbitrary nature of names, children at this age have other immature conceptions of language that indicate they are not prepared to analyze language as an abstract rule system. Many first-graders believe that every living creature, and every inanimate object as well, knows what its own name is in the child's native language. The great majority of children at age six do not understand that a person can believe something different from what he says. They believe that words

mean the same thing to everybody, and about half still do not understand that you can tell something about the way a person feels from the way he speaks or the words he uses (Brook, 1967). Intellectually they do not understand these things, but they do, in fact, act more appropriately in language situations than these immature understandings would suggest. Even four-year-olds simplify their speech when talking to children younger than themselves (Shatz & Gelman, in press). Unfortunately, it is intellectually that we often try to teach first-graders about language and reading.

A simple example of a point at which the difference between children's understandings and ours may lead to a lack of communication is our use of various language units and the names for those units in reading instruction. We talk of letters and the sound classes associated with them, of words and of sentences without much idea of what the children understand of these concepts. Both Clay (1966) and Reid (1966) studied children during their first year at school and noted many confusions in understanding the terms word and letter. Downing (1969) and Downing and Oliver (in press) have also noted confusion of phrases and sentences, phonemes and syllables with the concept of word. Kingston, Weaver, and Figa (1972) describe a series of five experiements all emphasizing the varied conceptions first-graders have of words and the potential difficulty that such conceptions present for the beginning reader.

Vygotsky (1962) made clear that we should expect children to have trouble learning to understand what words are: "Semantically, the child starts from the whole, from a meaningful complex, and only later begins to master the separate semantic units, the meanings of words, and to divide

his formerly undifferentiated thought into those units (p. 126)."

As literate adults we believe we know what words are, but we do not realize that our conception of what they are comes mainly from our having read so many of them. Holden and MacGinitie (1969, 1972) have verified that young children at about the age they are first taught to read have a quite variable conception of what words in spoken language are. A lexical unit that they regard as a separate word in one verbal context they may not regard as a separate word in some other verbal context. They frequently combine function words with content words and call the whole unit a word. For example, in the utterance "The dog wanted to eat," the children tended to treat to eat as a single word. When these pre-literate children were taught the printing convention--that word boundaries are indicated by spaces--they did fairly well at choosing a string of printed nonsense words that corresponded in number to the way they thought a real utterance should be divided into words, but they seldom divided utterances into the same individual words that they find in a real printed sentence. In a further study, Holden and MacGinitie (1973) found that the ability of kindergarteners and first-graders to attend to individual words in sentences correlated fairly highly (.68 corrected for unreliability of the measures) with children's conceptual development as measured by Piagetian seriation tasks. The procedure did not require the child to isolate all the individual words, but only to analyze sentences to the extent of begin able to tell what had been added when a sentence was repeated a second time with a new word or phrase added to it. This procedure is conceptually similar to that used by Rosner (in press) to test comprehension of linguistic concepts.

McGinnch (1971) found a moderate (r = .47) relation between a test of the ability to isolate words in sentences given at the beginning of the first grade and reading scores at the end of the year. In an unpublished follow-up of one of their earlier studies, Holden and MacGinitie found lower relationships than this between word awareness scores at the end of kindergarten and reading scores at the end of the following year. Thus, difficulties that children have in correlating their understanding of words in utterances with our conventional printed words are somewhat related to success in learning to read, but not as closely related as one might expect from the ubiquitous use of the word as a linguistic unit in reading instruction. One reason that the relation is not stronger may be that our printing conventions do not represent linguistic definitions of words very well. Linguists do not agree on a definition of the word (Kransky, 1969) or even on the significance of trying to define it. It may be that the child whose linguistic intuitions are acute finds many points at which his intuitions do not agree with the way our printing conventions segment sentences into words. In any case, a reiteration of an earlier conclusion seems appropriate: "clearly a first-grade teacher cannot take for granted that children will understand her when she talks about "words" and their printed representation. Nor can she assume that the concepts can be quickly and easily taught, since printed word units do not correspond to the way the child thinks the utterance should be divided (Holden & MacGinitie, 1972, p. 556)."

The demonstration that a child's ability to attend to individual words in sentences is related to his conceptual development led to a general hypothesis about the problem of teaching young children to read:

"Although the pre-operational child generates syntactic utterances, it cannot be assumed that he can comprehend the process of analyzing or synthesizing words or utterances as specimens. If these restrictions on young children's metalinguistic ability do exist, then trying to teach pre-operational children to read by decomposing words or sentences, on the assumption that words and the relations between words can then be synthesized, may be analogous to trying to train Piagetian operations. Such training frequently succeeds with the particular materials used in training, but the cognitive operations that generalize to new materials are difficult to establish (Holden & MacGinitie, 1973)."

There are other findings that lend support to this hypothesis. Belin (personal communication) has found that kindergarten children are usually unable to repeat exactly a slightly ungrammatical utterance. They transform it to a grammatical utterance. It is as if they can deal only with the global meaning and cannot analyze the departures from the way they would expect that meaning to be expressed. Rystrom (1972-73) has given examples showing why, from linguistic grounds, children might well have difficulties analyzing many of the written sentences they will be asked to read.

Let us now turn to smaller units of spoken and written language and consider the problems that children face in learning to use grapheme-phonemem correspondences to decode printed words. Gleitman and Rozin (in press), Liberman (1973), and Stott (1973) have described some of these potential problems. Learning to read is sometimes described as simply learning to decode the graphemic patterns into sound patterns representing

language that is already familiar to the child. The main problem with that description is "simply." Even when letter/sound-class correspondences are made relatively simple and more or less regular by using i.t.a. or by limiting the words to those that follow specific patterns, many children still have difficulty learning to read. What is it about the analysis of printed words in order to pronounce them that is so hard for many children to learn? At one level, a major obstacle to gaining decoding skills may be that knowledge of the phonemic structure of language is very difficult for the young child to attain (Liberman, 1973; MacGinitie, 1970).

> The difficulties...in learning to read may be related to the fact that the actual sound signal that represents a given phoneme varies considerably depending on its location in the given word and the speech sound that follows it.... It is also the case that it is frequently not possible to find specific segments in the stream of speech that can be identified with individual phonemes.(MacGinitie, 1970, p.11

> ...the phonemic segments are encoded at the acoustic level into essentially unitary sounds of approximately syllabic dimensions.... This is not to say that the phonemic elements are not real, but only that the relation between them and the sound is that of a very complex code.... (Liberman, 1973).

Decoding of vowels may present other problems:

> ...difficulties attendant upon the vowels are probably due in part to the obvious orthographic complexities of the spelling-to-sound correspondences but partly also to the continuous and fluid nature of vowel perception....as a consequence of the continuous nature of their perception, vowels tend to be somewhat indefinite as phonologic entities (Liberman, 1973)

At a more general level, a fundamental difficulty in learning to read may be the abstractness of the whole process. I have already indicated that we should expect the young child to have difficulty conceiving of a meaningful utterance as being made up of analyzable parts. He may have even greater difficulty analyzing a printed statement that is an abstract representation of a spoken utterance. It is a long way back from this printed representation, through an analysis of it, to a meaningful utterance that he finds difficult to conceive of as analyzable in the first place.

But what, exactly, do we ask the child to do when we ask him to analyze printed words so that he can pronounce them? As one way of beginning to seek an answer to this question, my students and I have been examining the primers and first readers of several basal reader series to see what kinds of reasoning tasks are required of the children by the instructional steps that these manuals prescribe. We have approached this study in two different ways. First, we have attempted to translate, into a descriptive, abstract notation, the logical steps that are required of the child by each lesson, assuming that the child performs the task in the way that the instruction seems to imply.[1] So far, we have restricted ourselves primarily to phonics lessons. We had two goals in mind for this analysis. First, we wished to gain an impression of just how complex the logical steps are that the children are typically asked to perfrom. Second, we wished to see if certain logical operations predominated in the instruction. Our results are incomplete and tentative at present, but two conclusions seem likely to stand up. One is that the complexity of the required logical operations varies enormously. The other is that there are, indeed, a few short series of logical operations that are sufficient to describe the great majority of phonics lessons, and even many lessons in structural analysis. I will describe two of these logical operations below, when I mention some of the results of the other approach we have taken to an analysis of the basal reader manuals.

This other approach has been to develop an analogue of the set of grapheme-phoneme correspondences, and, for many of the phonics lessons in the teachers' manuals, develop a parallel lesson using the analogue materials.[2] Our analogue has many shortcomings, as you will see, but it

has led to some useful insights. We use six geometric forms--triangle, square, rectangle, diamond, circle, and inverted U as analogues of letters. To each of these symbols we assign a characteristic color. For example, the triangle is usually red, and the square is usually blue. These colors are treated as analogues of the sound classes that letters represent. In our analogue lessons, in order to pronounce a word the child must either name the colors that go with each of the symbols in turn, or he must actually color in these symbols. Thus, the "word" that is spelled Triangle, circle, square, is pronounced "red, green, blue."

Our general procedure has been to pick, somewhat arbitrarily from the teacher's manual, a phonics lesson slightly in advance of where the individual child is working. We then teach this phonics lesson to the child and record the particular difficulties that the child seems to have in understanding that lesson. We then invent an analogous lesson with the colors and symbols and teach that anlaogous lesson to the same children. In these analogous lessons there are no problems with memory for the symbols and their associated colors, no problems of discrimination either of colors or symbols, no problems of blending, no problems of segmenting perceptually unitary speech signals, no problems of auditory-visual integration, and no help from a goal response that is the pronunciation of a familiar word. While these differences make our analogue in many important respects unlike the learning of reading, they also make it possible to study the child's ability to do the required logical manipulations unhindered by these problems, or aided by a familiar goal response.

Our first discovery was that occasional lessons in there manuals to primers and first readers are absurdly difficult for six-year-old children.

Let me give two examples. In the first example, the teacher is helping; the children use letter-sound associations and context to pronounce a word. The teachers is instructed to write the word girls on the board. The teacher then says, "You can find out what this word is. With what consonant does it begin? With what consonants does it end? You know the sounds that g and r and l and s stand for. I am going to say something and leave out this word at the end. When I stop, think of a word that begins with a sound g stands for, ends with the sounds r and l and s stand for and makes sense with what I said." Now obviously, that instruction is a bit much for most adults, let alone most six-year-olds. Our analogue for that bit of instruction went as follows: the children were shown several rows of color patches, and they were told to "Find the row that begins with the color that goes with rectangle, ends with the colors that go with triangle, diamond and square and that has a wavy line under it." Well they couldn't do that either, of course.

A second example is more typical. The teacher, and this is in a primer, mind you, has just explained, using work and worked as an example, that ed may be added to a word to show past action. She has asked a child to tell whether the final sound of work is voiced or voiceless. The teacher is now instructed to "tell the children that ed stands for /t/ when it is added to a word that ends with any voiceless consonant letter except t." In several cases when we found instructions that required unreasonably difficult logical operations, these instructions resulted from trying to explain linguistic rules that aren't fo much pertinence in learning to read, anyway. Perhaps writers of recent primers and first readers have included too much linguistic detail. Most adults who are excellent readers

have no idea that there are different allomorphs of the past tense morpheme, let alone in which phonological contexts those allomorphs are used. The adults pronounce words perfectly well and read perfectly well without ever knowing that "ed stands for /t/ when it is added to a word that ends with any voiceless consonant except t." Our analogue for that one was: "triangle is blue when it is added to a word that ends with any four sided figure except square."

I have given you two extreme examples. They are not really what I had in mind when I said earlier that children learn to read in spite of the logical analysis with which we try to guide them. What are some logical tasks that are more characteristic of those imposed on children in learning to decode? One very simple and very common pattern is exemplified by the following. After a reading lesson in a primer the teacher says, "Today you read two words that are alike in a special way. Listen carefully as I say these words and tell me how they are alike." The teacher then pronounces now and not. In order to respond correctly to this problem, the child must find the union of the sets of phonemes comprising these two words. It is not clear from the instructions that the position within the phoneme sequence in the two words is relevant to the task. But the important question is, what process does the child follow in determining that the similarity that the teacher has asked about is that both words begin with /n/? Does he hear similar sounds and then compare their position? Does he compare the two phoneme sequences, position by position, in order to see which positions involve the same phonemes? Does his ability to segment the word depend on comparisons between the two words? These and similar questions may be answered differently for different children

We don't know what the child does when given a very simple problem of this sort, and we don't know what to advise him to do. Most of the children we worked with had little difficulty with this problem, and most of the children had little difficulty doing our analogue of it. A few children did not get it right off. Are they children who will have other difficulties in learning to read?

Another very characteristic kind of task is seen in the following example from a first reader. The teacher is told to write the words red, sled, Fred on the board. She asks the children to read the words aloud, and she underlines the rhyming parts. She then changes the r in red to b. Then she writes be, but, and ball and asks, "What word ends with /ed/ and begins with the same sound as be, but, and ball?" Now this is a very characteristic lesson. The teacher presents some visual stimuli and some auditory stimuli. The child must find the common letter in the visual stimuli. What process he uses to do this we do not know. The child must also find the common phoneme in the auditory stimuli, in this case the phoneme /b/. Again, what process he uses to do this we do not know. He may then follow a logical process similar to "equals added to equals yield equals." That is, he may reason that, if b added to ed produces bed then /b/ added to /ed/ produces /bed/. What logical process he actually follows, is not known to us, and we do not know what would be an efficient procedure for a six-year-old. A principal difficulty undoubtedly comes from the fact mentioned earlier, that /bed/ cannot readily be segmented into three separate sound units corresponding to the three letters in bed. Many of the children we worked with had difficulty with this kind of very common lesson, when it was presented as a simple logical instruction. That is, when we simply followed the manual, and said, "what word ends with

/ed/ and begins with the same sound as be, but, and ball?", the children could not give the answer. Neither could they do our analogue, "which word ends with the shapes you just underlined and begins with the same shape as these words here?" On the other hand, once the instruction was taken apart bit by bit, or an example shown to them, they could answer correctly and work similar examples.

Apparently children learn to watch for the things that they can do and from those elements build up a body of skills and knowledge about reading. Naturally, good teachers will help them with this process, step by step. We should be fully aware, however, that many of the logical processes we ask the child to go through in learning to read, if presented straightforwardly in their full complexity are too much for the child to understand. The instruction "what word ends with /ed/ and begins with the same sound as be, but, ball?", is not particularly simple to begin with. When you also consider that the word, word is an amorphous construct for most of these children, that "ends with" and "begins with" involve segmentations that may be difficult and may violate the natural perceptual boundaries in many instances (Liberman, 1973; Massaro, 1972), when you realize that the instruction is ambiguous as to the interior of the word, and that bread or bulkhead or breviped could be correct answers, then it is easy to see that this could well be an impossible instruction for a six-year-old child. The effectiveness of a lesson often depends on a great deal of prior practice in the individual steps in the process and

depends on a well-established, agreed-upon understanding of what the concepts "word," "ends with," and so on, mean in the context of a reading lesson.

These preliminary studies that I have reported make clear that there are several lines of research that should be undertaken in the support of improved reading instruction. First, our work showed that children have much more difficulty with rules that involve changes from a regular pattern, for example the different phonemes represented by the letter c when it preceeds a back vowel or a front vowel, or the vowel change that accompanies the addition of a "silent e." One line of research that we are concerned with, then, is the specific effect of these more complex rule-governed patterns that the children must learn.

Second, the children were often able to do the analogue lessons more easily than the parallel phonics lessons. A second focus for future research is to explore the bases for this difference. I mentioned earlier several important differences between our analogue and actual decoding in reading. Which of these differences, or others, result in some phonics lessons being more difficult than their logical structure would predict? Our preliminary impression is that the large number of possible alternative sound class responses, particularly for vowels, as compared to the limited number of possible alternative color responses in the analogue, is an important factor, as is the difficulty of segmenting speech signals into phoneme units.

The children that we studied had relatively little difficulty with straightforward substitution or concatination of letters or speech sounds,

but, for some children, or for some instructional sequences, even these processes caused difficulty. I have pointed out earlier that we know very little about what the child does or what he needs to learn to do with these more straightforward logical problems, and investigations in this direction constitute another and most promising line of research.

Finally, we have observed that, although a few logical paradigms represent most of the instruction that is given, the same basic concepts are taught using different paradigms in different manuals or in different places within the same manual. Some of these paradigms seem inherently more difficult than others, and, if we could show that this is so, we could urge more reliance on the less complex ways of presenting the basic knowledge. We are currently engaged insome exploratory research for this purpose.

We sincerely hope that our work directing attention to the difficulties children encounter with the elemental concepts and the basic logical processes of beginning reading will lead to better understanding of the process of learning to read and consequently to better reading instruction.

Footnotes

[1] Most of this analysis was performed by Harvey Mar and Joseph Salvata

[2] Joyce French, LaMarian Hayes, Toni Siegel, and Marlene Vellutino have all contributed to this work.

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